A Compact, Efficient Pyrolysis/Oxidation System for Solid Waste Resource Recovery in Space, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

Both pyrolysis and oxidation steps have been considered as the key solid waste processing step for a Controlled Ecological Life Support System (CELSS). Pyrolysis is more amenable to handling mixed solid waste streams in a microgravity environment, but produces a more complex product stream. Oxidation (incineration) produces a simpler product stream, but the oxidation of mixed solids is a complex unit operation in a microgravity environment. Pyrolysis is endothermic and requires no oxygen, while oxidation is exothermic and requires oxygen. A previous NASA SBIR Phase I and Phase II project has successfully integrated pyrolysis of the solid waste and oxidation of the fuel gases into a single, batch processing prototype unit. This Small Business Innovation Research Phase I project addresses the feasibility of integrating pyrolysis, tar cracking, and oxidation steps into a compact, efficient system for processing of spacecraft solid wastes. This integration will result in a reduction in energy consumption, an overall reduction in system complexity, and a lower Equivalent System Mass (ESM). The objective of the Phase I study is to demonstrate the feasibility of this integration process using bench scale experiments. This will be accomplished in three tasks: 1) design and construct integrated bench scale unit; 2) laboratory studies using simulated solid waste sample; 3) evaluation of laboratory results and preliminary design of Phase II prototype.

Primary U.S. Work Locations and Key Partners

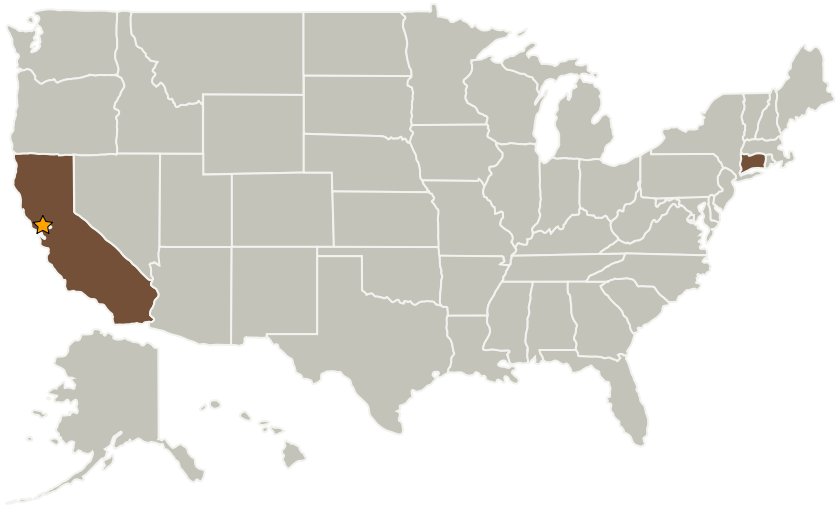

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Advanced Fuel Research, Inc.	Supporting Organization	Industry	East Hartford, Connecticut

Primary U.S. Work Locations	
California	Connecticut

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.2 Mission Infrastructure, Sustainability, and Supportability
    - TX07.2.1 Logistics Management